(12) UK Patent Application (19) GB (11) 2 236 308 (13) A

(43) Date of A publication 03.04.1991

(21) Application No 8921781.4

(22) Date of filing 27.09.1989

(51) INT CL[5]
B65D 55/02

(52) UK CL (Edition K)
B8T THSA T13A

(56) Documents cited
GB 2210360 A GB 2180826 A GB 2146008 A
GB 2099802 A US 3853236 A US 3830390 A

(58) Field of search
UK CL (Edition J) B8T THSA
INT CL[4] B65D 55/00 55/02

(71) Applicants
Ronald Brian McAllister
S & M Products, Compstall Mill, Compstall, Stockport, Cheshire, United Kingdom

Henry Sutton
S & M Products, Compstall Mill, Compstall, Stockport, Cheshire, United Kingdom

(72) Inventors
Ronald Brian McAllister
Henry Sutton

(74) Agent and/or Address for Service
David John Goddard
Vine House, 22 Hollins Lane, Marple Bridge, Stockport, Cheshire, SK6 5BB, United Kingdom

(54) Safety cap for a container

(57) A safety closure cap for a container comprises an outer cap member 12 having a substantially circular top panel from which depends an annular skirt 18 having formed on the inner wall thereof a plurality of driving means 26 arranged to apply a cap closing torque without the need for a substantial axial force and to apply a cap opening torque only with the application of an axial force, said axial force being substantially proportional to the opening torque required; and an inner cap member 14 having a substantially circular top panel from which depends an annular threaded skirt means 48 formed on the outer periphery to cooperate with the driving means 26 on the outer cap member, the inner cap member being retained within the outer cap member by an inturned rim 30 on the outer cap skirt. The driving and driven means may comprise co-operating teeth and sockets.

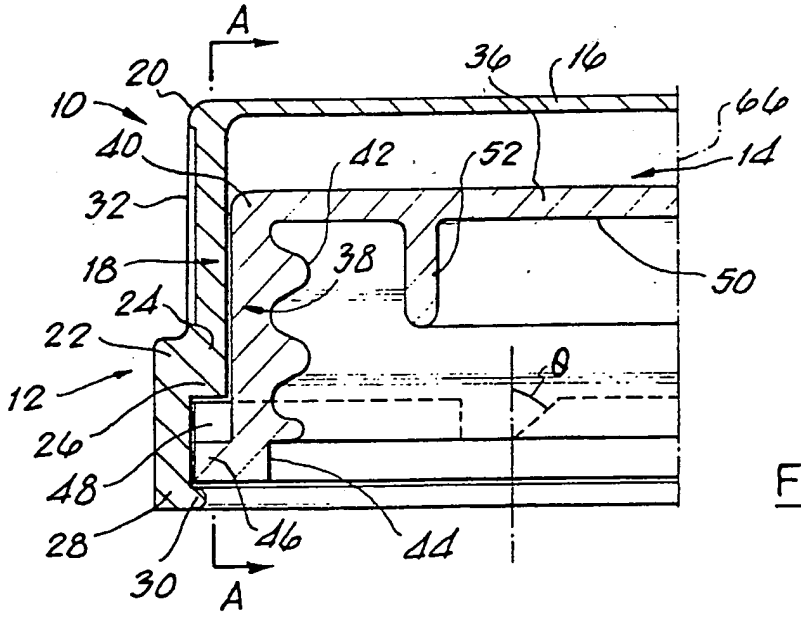

FIG.1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

This print incorporates corrections made under Section 117(1) of the Patents Act 1977.

GB 2 236 308 A

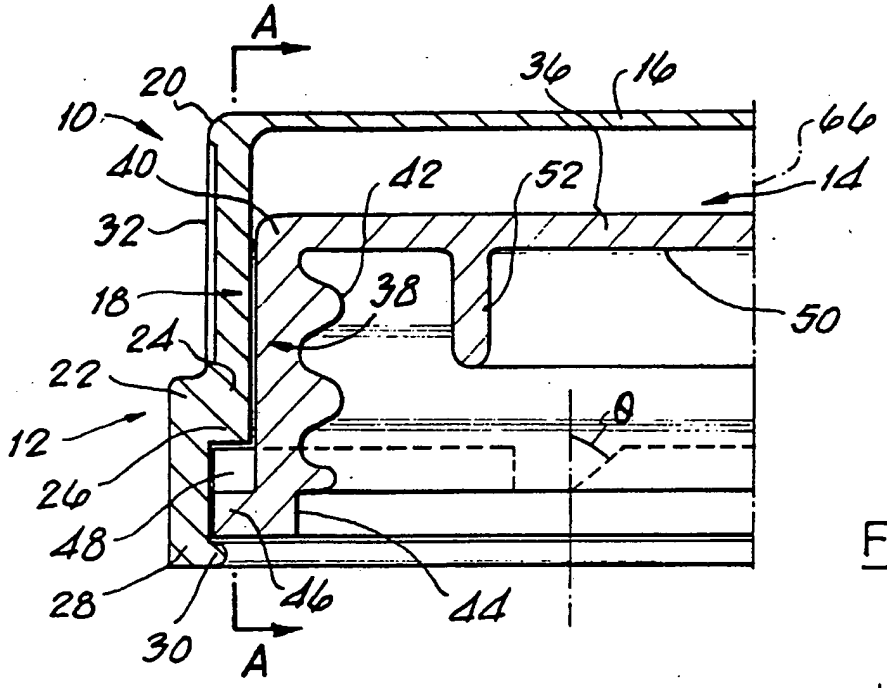

FIG.1

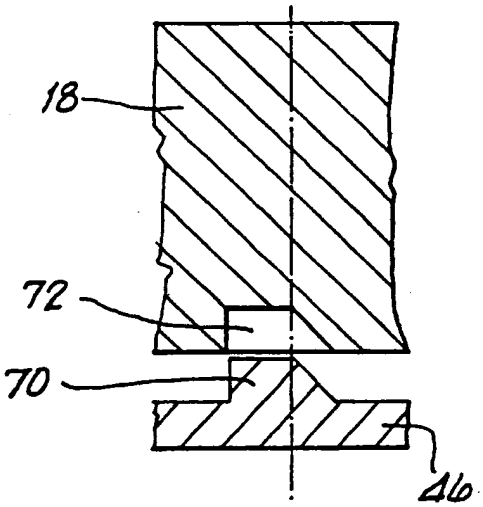

FIG.3

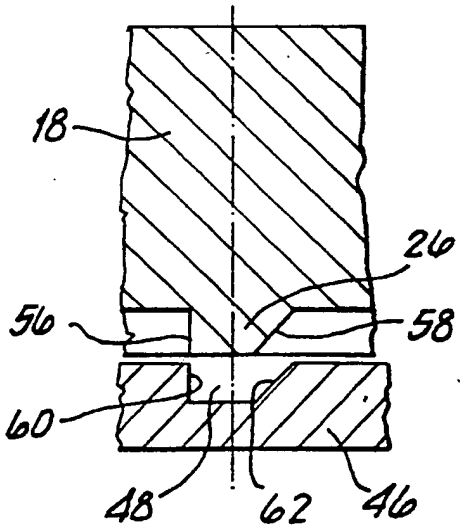

FIG.2

SAFETY CAP

The present invention relates to safety closures made from plastics materials for containers, especially containers having screw threaded portions for receiving a closure.

Safety closures, often referred to as child-proof caps, are well known. One such cap is described in GB 1 438 885 and comprises inner and outer cap components. The outer cap component has plastics material leaf springs moulded onto the inner horizontal flat surface which continuously bear against the upper outer surface of the inner cap component which has moulded abutments thereon. The abutments allow, with the leaf springs a turning torque to be applied when securing the cap to a container and provide a ratchet action when a torque is applied to remove the cap. To unscrew the cap it is necessary to depress the outer cap component by applying an axial force to overcome the resistance of the leaf springs which causes castellations on both the cap components to engage and allow a turning torque to be applied to unscrew the cap. One disadvantage of this type of cap is that only a substantially constant axial force need be applied regardless of how tightly the cap may be screwed to the container. A further disadvantage is that complicated and, therefore, expensive tooling is

required to mould this type of cap and thus, the caps are themselves expensive.

In some instances it is desirable that an axial force proportional to the required turning torque be employed to remove a secured cap; thus, a tightly applied cap would require a greater axial force than would a relatively more loosely applied cap. Such instances may include containers filled with dangerous chemicals which it is particularly desirable to keep from children, for example.

Another known cap also comprising two components has a knurl applied to the top outer periphery of the inner cap, the knurl cooperating with the top inner periphery of the outer cap component. In the closing direction the two knurls, because of their mutual geometry, grip each other to allow a tightening torque to be easily applied. In openning direction their geometry causes the knurls to disengage therefore necessitating an axial force to keep them in engagement. A disadvantage with this design is that if the cap requires too great a turning torque to free it, the knurls tend to either deform and slip or it is not possible to apply sufficient axial force to reach the required turning torque to remove the cap

An object of the present invention is to provide a safety cap at an economic cost. A further object is to provide a cap where

an axial force proportional to the torque required to free it is necessitated.

According to the present invention a safety closure cap for a container comprises an outer cap member having a substantially circular top panel, an annular skirt depending from the periphery of the panel, the skirt having a plurality of driving means formed on the inner wall thereof, the driving means being adapted to apply a cap closing torque without the need for a substantial axial force and to apply a cap openning torque only with the application of an axial force, said axial force being substatially proportional to the openning torque required, the skirt further including an inturned rim at it's lower extremity remote from the top panel; an inner cap member received within the outer cap member, the outer cap member having a substantially circular top panel, an annular skirt depending from the outer periphery of the panel, the skirt including a threaded portion to cooperate with a threaded portion on the container to be sealed, the skirt further including driven means formed on the outer periphery to cooperate with the driving means on the outer cap member, the inner cap member being retained within the outer cap member by the inturned rim.

In one embodiment of the cap the driving and driven means are in the form of cooperating teeth and sockets, the teeth being formed on the inner surface of the skirt of the outer cap member and the sockets being formed on the outer surface of the

skirt of the inn r cap member. Each cooperating tooth and socket may have ne substantially vertical face, i.e. parallel to the cap axis, and one angled face. In the cap closing direction the vertical faces of the driving and driven means are brought into engagement, thus allowing whatever turning torque that may be desired to be applied without the need for any significant axial force other than that which is sufficient to hold the two cap members in engagement. To remove the cap it is necessary to apply an axial force to hold the two angled faces of the driving and driven means in engagement. If the axial force is insufficient the two angled faces will tend to slide over each other; in order to make the angled faces grip each other it is necessary to increase the axially applied force until sufficient turning torque is applied to the cap.

It will be appreciated by those skilled in the art that the provision of the teeth and sockets may be reversed in that the teeth may be provided on the inner cap member and the sockets may be formed on the outer cap member.

The slope of the angled faces may be varied to provide control of the ratio of axial force to turning torque which must be applied. The smaller the angle, with regard to the cap axis, the lower will be the necessary axial force for any given turning torque required, i.e. if the "angled" face were parallel to the cap axis an equal closing and openning torque could be applied with the same axial force.

In practice it has been found that the angled face is most advantageously formed with an angle lying in the range from 35 degrees to 55 degrees with respect to the cap axis.

The inturned rim on the lower edge of the skirt of the outer cap member provides a "snap-fit" function and prevents the outer cap from being easily removed from the inner cap member.

The threaded portion of the inner cap member may be of either male form, extending from the lower extremity of the skirt of the inner cap member to be received in a female thread in the container, or may more preferably, be of female form, formed on the inner surface of the skirt.

The inner cap member may be provided with any additional sealing features which may be desired; such features may include an annular male lip which is received inside the neck of the container to be sealed.

The inner and outer cap members may be formed from different materials in order to be compatible with the contents of the container.

In order that the present invention may be more fully understood, examples will now be described by way of illustration only, with refernce to the accompanying drawings , of which:

Figure 1 shows a section through a cap according to the inventi n;

Figure 2 shows a part section on the line A-A, looking in the direction of the arrows, of the driving and driven means of Figure 1; and

Figure 3 which shows an alternative embodiment of driving and driven means to that shown in Figure 2.

Referring now to Figures 1 and 2 and where the same features are designated by common reference numerals.

A safety screw-cap is shown generally at 10 and comprises an outer cap member 12 and an inner cap member 14. The outer cap member 12 has a substantially circular top panel 16 with an annular skirt 18 depending from the periphery 20. At the lower part 22 of the skirt 18 and formed on the inner wall 24 are driving means 26 in the form of teeth, the lower extremity 28 of the skirt 18 terminating in an inturned rim 30 which retains the inner cap member 14 within the outer cap member by a "snap-fit". On the outside of the upper portion of the skirt 18 are fine splines 32 moulded into the surface to assist in gripping the cap with the fingers. Received within the outer cap member 12 is the inner cap member 14 which has a substantially circular top panel 36 which also has an annular skirt 38 depending from the outer periphery 40 thereof. The skirt 38 has

a female screw thread 42 moulded on the inner surface to cooperate with a male screw thread (not shown) on a container to be sealed. At the lower end 44 of the skirt 38 there is an out-turned flange 46 in which are driven means 48 in the form of sockets shaped to receive and cooperate with the teeth 26. On the inner surface 50 of the panel 36 there is an annular spigot 52 which enters the neck (not shown) of the container (not shown) to seal therewith.

In the embodiment shown there are nine teeth 26 and sockets 48 evenly disposed about the skirts 18, 38. The teeth 26 have one vertical face 56 and one angled face 58; similarly the sockets 48 have one vertical face 60 and one angled face 62. Both angled faces 58, 62 form an angle O of 45 degrees to a line 64 which is parallel to the cap axis 66.

In operation the inner and outer cap members are able to slide axially with respect to each other. To screw the cap onto a container the outer cap member is pushed axially downwards and rotated until the teeth 26 and sockets 38 engage; the cap is then rotated in a clockwise direction, when viewed from above, so that the two vertical faces 56, 60 are in contact and the desired closing torque may be applied without the need for any additional, substantial axial force. To unscrew the cap the teeth and sockets are again brought into engagement but because the two angled faces 58, 62 tend to slide with respect to each other, a significant axial force must be applied to maintain

the two faces in driving engagement when starting to turn in the anti-clockwise direction. The degree of axial force will depend upon the torque necessary to free the cap from the container neck (not shown).

Figure 3 shows a variation where the out-turned flange 46 is provided with teeth 70 as the driven means and the inner wall of skirt 18 is provided with sockets 72 as the driving means.

The sockets 48, 72 may be provided in equal numbers to the teeth 26, 70, or in multiples thereof.

The embodiment shown is particularly economic to produce being able to be made with relatively simple two-piece injection moulding tooling. The faces 56, 60 could be provided with a small negative rake angle to give a positive gripping action when securing the cap in place; however, this would increase the cost and complexity of the moulding tooling.

CLAIMS

1. A safety closure cap for a container, the safety closure comprising an outer cap member having a substantially circular top panel, an annular skirt depending from the periphery of the panel, the skirt having a plurality of driving means formed on the inner wall thereof, the driving means being adapted to apply a cap closing torque without the need for a substantial axial force and to apply a cap openning torque only with the application of an axial force, said axial force being substatially proportional to the openning torque required, the skirt further including an inturned rim at it's lower extremity remote from the top panel; an inner cap member received within the outer cap member, the inner cap member having a substantially circular top panel, an annular skirt depending from the outer periphery of the panel, the skirt including a threaded portion to cooperate with a threaded portion on the container to be sealed, the skirt further including driven means formed on the outer periphery to cooperate with the driving means on the outer cap member, the inner cap member being retained within the outer cap member by the inturned rim.

2. A safety closure cap according to claim 1 wherein the driving means and driven means are in the form of co-operating teeth and sockets.

3. A safety closure cap according to claim 2 wherein the teeth are provided on the inner surface of the skirt of the outer cap member and the sockets are provided on the outer surface of the skirt of the inner cap member.

4. A safety closure cap according to claim 2 wherein the sockets are provided on the inner surface of the skirt of the outer cap member and the teeth are provided on the outer surface of the skirt of the inner cap member.

5. A safety closure cap according to any one preceding claim wherein each tooth and socket possess one vertical face, substantially parallel to the closure cap axis, and one angled face.

6. A safety closure cap according to claim 5 wherein the substantially vertical faces are brought into engagement in the cap closing direction.

7. A safety closure cap according to claim 5 wherein the angled faces are brought into engagement in the cap removing direction.

8. A safety closure cap according to any one preceding claim wherein the inturned rim of the outer cap member provides for a "snap-fit" retention of the inner cap member.

9. A safety closure cap according to any one of preceding claims 5 to 8 wherein the angled face has an angle lying in the range from 35 degrees to 55 degrees.

10. A safety closure cap according to claim 9 wherein the angled face has an angle of substantially 45 degrees.

11. A safety closure cap according to any one preceding claim from 2 to 10 wherein there are an equal number of teeth and sockets.

12. A safety closure cap according to any one preceding claim from 2 to 10 wherein the number of sockets is a multiple of the number of teeth.

13. A safety closure cap according to claim 11 wherein there are nine teeth and sockets.

14. A safety closure cap according to any one preceding claim wherein the threaded portion on the inner cap member is a female threaded portion.

15. A safety closure cap substantially as hereinbefore described with reference to the accompanying specification and Figures 1 and 2 or 3 of the drawings.

Published 1991 at The Patent Office, State House, 66/71 High Holborn, London WC1R 4TP. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.